510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
DEVICE ONLY TEMPLATE

A. 510(k) Number:
K033983

B. Purpose for Submission:
New product

C. Analyte:
Total iron

D. Type of Test:
Quantitative

E. Applicant:
Clinical Data, Inc.

F. Proprietary and Established Names:
Vitalab Iron Reagent and Calibrator

G. Regulatory Information:

1. Regulation section:
   21 CFR §862.1410 Iron (non-heme) test system
2. Classification:
   Class I
3. Product Code:
   JIY
4. Panel:
   Chemistry (75)

H. Intended Use:

1. Intended use(s):
   Vitalab Iron Reagent is for the quantitative determination of total iron in serum and plasma using the Vitalab Selectra Analyzer.

2. Indication(s) for use:
   The Vitalab Iron Reagent Kit, which contains both reagent and calibrator, is intended for use with the Vitalab Selectra E Analyzer as a system for the quantitative determination of total iron in serum and plasma. Iron results may be used for the diagnosis and treatment of diseases such as iron deficiency anemia, hemochromatosis (a disease associated with widespread deposit in the tissues of two iron-containing pigments, hemosiderin and hemofuscin, and characterized by pigmentation of the skin), and chronic renal disease.

3. Special condition for use statement(s):
   None

4. Special instrument Requirements:
   The Vitalab Iron Reagent Kit is intended for use with the Vitalab Selectra Analyzer.

I. Device Description:

The device consists of vials of Vitalab Iron Reagent 1, Vitalab Reagent 2, and Vitalab Iron Calibrator. This liquid product is used to quantitatively determine total iron in serum and plasma using the Vitalab Selectra Analyzer. The sample is added to the first reagent component allowing for sample blank reading before the addition of the second reagent. Total iron concentrations are calculated from the change in absorbance at 578 nm after the reaction is finished.

J. Substantial Equivalence Information:

1. Predicate device name(s):
   Beckman Synchron Systems Iron (Fe) and Total Iron Binding Capacity (IBCT) Reagents

2. Predicate K number(s):
   K960485

3. Comparison with predicate:

Similarities		
Item	**Device**	**Predicate**
Intended Use	Quantitative determination of total iron in serum and plasma	same
Measurement method	Endpoint with sample blank measured at approximately 570 nm (578 nm)	same (560 nm)
Calibration	Single point with reagent blank	same
Matrix	Serum or heparinized plasma	same
Differences		
Item	**Device**	**Predicate**
Product type	Calibrated endpoint reagent with sample blank	Calibrated endpoint reagent
Chemical Reaction	Chelation of Fe^{2+} cation by ferene after reduction in acetate buffer	Chelation of Fe^{2+} cation by ferrozine after reduction in acetate buffer
Reagent components	ferene (iron chelator) thiourea (sulfhydryl reducing agent) acetic acid buffer other ingredients	ferrozine (iron chelator) thioglycolic acid (sulfhydryl reducing agent) acetic acid and hydroxylamine hydrochloride other ingredients
Analytical Range	10 to 1,000 μg/dL	5 to 500 μg/dL

K. Standard/Guidance Document Referenced (if applicable):

NCCLS Publication: Vol. 2 No. 20, Tentative Guidelines for Manufacturers for Establishing Performance Claims for Clinical Chemical Methods, Replication Experiment. NCCLS, Villanova, PA, (1982). Precision is calculated using NCCLS EP3-T, "Tentative Guidelines for Manufacturers for Establishing Performance Claims for Clinical Chemical Methods, Replication Experiment."

L. Test Principle:

Iron in the specimen is released from the transferrin using acetic acid. This iron is reduced to the ferrous cation and is bound by ferene, which is a sensitive iron indicator. The increase in absorbance at 578 nm after subtracting the sample blank is proportional to the iron concentration of the sample.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Serum controls are assayed in triplicate twice per day over eleven days on a single Selectra Analyzer. Estimates of within run and total imprecision are calculated as described in NCCLS publication EP3-T.

Precision of Vitalab Iron Reagent

			Within Run		Total	
Sample	n	mean	1SD	%CV	1SD	%CV
Serum 1	66	57	0.9	1.6%	1.5	2.7%
Serum 2	66	158	0.9	0.6%	3.0	1.9%
Serum 3	66	260	1.0	0.4%	5.2	2.0%

b. Linearity/assay reportable range:

Eleven iron standards are prepared to span the linear range of the application by dissolving NIST iron in a dilute hydrochloric acid matrix. These standards are assayed on a single Selectra E Analyzer in ascending order over four independently calibrated analytical runs. Standard recoveries are compared to their reference values by least squares linear regression. A residual statistic is calculated for each standard as the difference between the mean recovery and its value predicted from the regression statistics. The assay is linear from 0 ug/dL to 1,000 µg/dL as shown by residuals of less than 5 µg/dL.

c. Traceability (controls, calibrators, or method):

Calibrator set points are traceable to NIST SRM 937. The calibrator was approved under K935712 as a kit component. The shelf-life of the iron reagent is 15 months. Data supporting this claim were provided by the OEM.

d. Detection limit:
Normal saline is assayed thirty times in a single analytical run. The detection limit is calculated as the mean plus two standard deviations of the results. The observed mean and standard deviation are 0.00 and 1.20 μg/dL respectively. Therefore, the detection limit of the assay is 2.4 μg/dL iron.

e. Analytical specificity:
Potential interference from icterus (bilirubin) and lipemia (triglycerides) was determined in separate studies. In each study, a serum pool with approximately normal iron levels is prepared from individual patient specimens and is divided into two aliquots. One aliquot was spiked with the potential interfering substance. The other aliquot was diluted with normal saline, as necessary, to mimic the dilution the spiked pool. Ditaurobilrubin (for bilirubin) was tested at concentrations up to 40 mg/dL with ≤4.1% bias while Intralipid was tested at concentrations up to 2000 mg/dL with ≤ -2.3% change in recovery.

f. Assay cut-off:
Not applicable.

2. Comparison studies:

a. Method comparison with predicate device:
Random specimens from individual anonymous adult patients were collected from local clinical labs. These unaltered samples were supplemented with one additional frozen serum specimen with an elevated iron concentration to yield a total of 60 serum and 60 heparinized plasma specimens. These specimens were randomly assorted into groups of 15 serum and 15 plasma specimens each. One group of serum and plasma specimens was assayed in each of four runs using the Vitalab Selectra Iron Application and the Beckman Iron Reagent on the Synchron CX5; each instrument was calibrated for the iron reagent with its required calibrator before each run.

The serum results, plasma results and the combined results for both specimen types are each compared by Deming regression assuming equal variances between methods. Regression statistics are given below:

Regression Statistics: Comparison of Candidate and Predicate

	Values in ug/dL (95% confidence intervals)		
Value	**Serum**	**Plasma**	**Combined**
Intercept	-1.6 (-3.0 to -0.1)	2.2 (0.4 to 4.0)	1.1 (0 to 2.3)
Slope	1.005	0.992	0.988
$s_{y,x}$	1.8	2.4	2.3
N	60	58	118
Range	13 to 287	9 to 161	9 to 287

b. Matrix comparison:
Serum and plasma specimens are individually compared to the predicate method by Deming regression. Regression slope statistics for these two specimen types agree to with 1.3% and the substantial overlap in their 95% confidence intervals indicates equivalency. The y-intercept statistics agree to within 4 ug/dL, which is an insignificant error compared to the clinical requirements of the test.

3. Clinical studies:
   a. Clinical sensitivity:
   Not applicable.
   b. Clinical specificity:
   Not applicable.
   c. Other clinical supportive data (when a and b are not applicable):
   Not applicable.

4. Clinical cut-off:
   Not applicable.

5. Expected values/Reference range:
   Reference ranges are established in the literature and quoted from Tietz Textbook of Clinical Chemistry, Third Edition, Burtis and Ashwood, editors, W. B. Saunders Company (1999).

N. Conclusion:

The submitted information in this pre-market notification is complete and supports a substantial equivalence decision.